Jan. 2, 1945. R. E. SMITH 2,366,292

FILAMENT JOINT STRUCTURE FOR ELECTRIC LAMPS

Filed Oct. 11, 1943

Fig. 1.

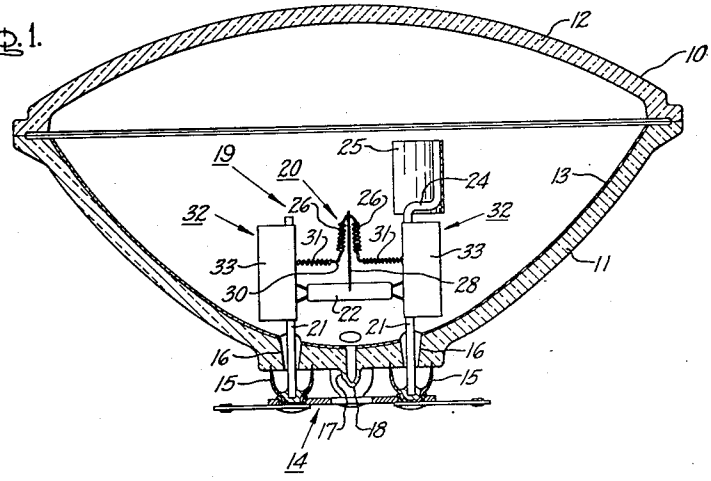


Fig. 2.

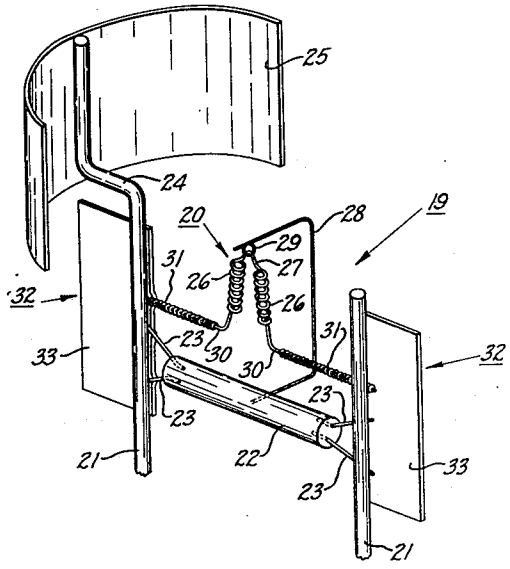


Fig. 3.

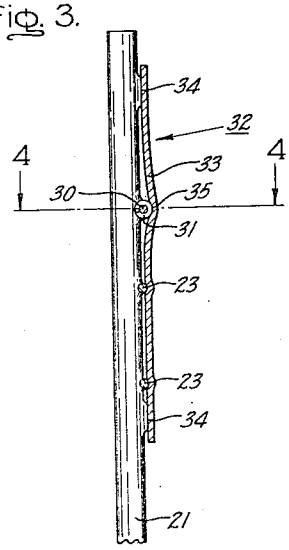
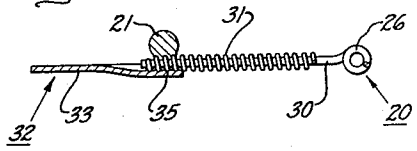


Fig. 4.



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UNITED STATES PATENT OFFICE

2,366,292

FILAMENT JOINT STRUCTURE FOR ELECTRIC LAMPS

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12 Claims. (Cl. 176—38)

My invention relates in general to electric incandescent lamps and similar devices, and more particularly to high wattage lamps and devices. Still more particularly my invention relates to an improved joint or connection between the filament and leading-in conductors of such devices.

In the manufacture of high wattage electric incandescent lamps for certain purposes, such as the production of a concentrated beam of light, it is desirable for manufacturing and other reasons to employ lead-in wires or conductors of a minimum size or diameter. However, where lead-in wires made of iron are employed as a substitute for the nickel leads heretofore used in certain types of high wattage lamps operating at high current values, the iron leads tend to distort during the life of the lamp due to the excessive heating of the lead-in wires at the filament joint. This is particularly true where iron lead-in wires of the desired small size are used. Such distortion of the lead-in wires is apt to cause distortion of the filament and may result in rupture of the filament or breakage of the filament joint.

One object of my invention is to provide an improved joint or connection between the filament and lead-in conductors of electric incandescent lamps and similar devices which joint is characterized by a relatively low operating temperature.

Another object of my invention is to provide an electric incandescent lamp or similar device with a filament joint having a relatively high heat-dissipating capacity.

Still another object of my invention is to provide an electric incandescent lamp or similar device with a filament joint having heat-dissipating means associated therewith of such construction as to intercept a minimum of the radiations emanating from the lamp filament.

A further object of my invention is to provide a high-wattage high-amperage electric incandescent lamp having means for preventing distortion of the lamp lead-in conductors during the life of the lamp.

A feature of the invention is the attachment of suitable heat-dissipating members to the lead-in conductors at the junctions of the lamp filament with the said conductors. A further feature of the invention is the use of thin metal plates as such heat-dissipating members, the metal plates being fastened to the lead-in conductors in such manner as to be disposed substantially in the plane of the lamp filament whereby a minimum of the radiations from the lamp filament are intercepted by the plates.

Further objects and advantages of my invention will appear from the following description of a species thereof and from the accompanying drawing in which:

Fig. 1 is an elevation, in section, of an electric incandescent lamp comprising my invention; Fig. 2 is a perspective view on an enlarged scale of the mount structure of the lamp shown in Fig. 1; Fig. 3 is an elevation, partly in section and on an enlarged scale, of the filament joint comprising my invention; and Fig. 4 is a section on the line 4—4 of Fig. 3.

Referring to the drawing, the lamp there shown is of the self-contained reflector type described and claimed in U. S. Patents Nos. 2,148,314 and 2,148,315—D. K. Wright, issued February 21, 1939 and assigned to the assignee of the present invention. The lamp comprises a bulb or envelope 10 consisting of a preformed pressed glass reflector section 11 fused around its periphery to a preformed pressed glass cover section 12. The interior surface of the reflector section 11 is of a light-concentrating shape, preferably paraboloidal, and is covered with a metallic coating 13, preferably of aluminum, constituting a reflecting surface. Mounted on the reflector section 11, exteriorly thereof and at the apex of said section, is a base structure 14. The base structure 14 is suitably secured, as by soldering, to metallic cups or thimbles 15 having their edges sunk and embedded in the glass of the reflector section 11 around openings 16 therein, the cups or thimbles 15 thus hermetically closing the openings 16. The envelope 10 is exhausted and filled with a suitable gas through an exhaust tube 17 attached to the reflector section 11 at its apex. After the gas filling is introduced into the lamp envelope, the exhaust tube 17 is tipped off, as indicated at 18, to hermetically seal the envelope.

Mounted within the envelope 10 and supported therein from the metal thimbles 15 is a mount structure 19 comprising an electric energy translation element or filament 20 disposed between and connected to a pair of rigid lead-in wires or conductors 21, 21 which, in this case, are made of iron. The lead-in wires 21 are rigidly secured at their outer ends to the metal thimbles 15, as by soldering, and extend straight through the openings 16 in the reflector section into the interior of said section in parallel relation to one another and preferably in a plane parallel to and including the axis of the reflector section. The lead-in wires 21 are held in rigid spaced relation by an insulating bridge or cross bar comprising a glass rod 22 extending between and secured to

the lead-in wires 21 by short fastening wires 23 which may be spot-welded to the lead-in wires. The inner end of one of the lead-in wires 21 is formed with a lateral extension 24 to which is secured a shield 25 for intercepting certain of the direct radiations from the filament which otherwise would pass out through the cover glass 12 of the lamp envelope.

The filament 20 is of the high-wattage monoplane type comprising a plurality of coiled wire segments 26 of tungsten which extend in the general direction of the reflector axis and are joined by a bight portion 27. The filament segments 26 are disposed in the plane of the lead-in wires 21 and in a position in definite optical relation to the focus of the reflecting surface 13, preferably symmetrically about the reflector focus. The filament is supported in place at the bight portion 27 thereof by means of a support or anchor wire 28 having a hooked end 29 engaging the bight 27 and its other end rigidly secured to the glass rod 22 of the insulating bridge, as by embedding therein. Each end of the filament 20 is provided with a straight or uncoiled end section or leg portion 30 extending laterally of the lead-in wires 21 and over which is slipped a coil 31 of a suitable heat-resisting metal such as tungsten or molybdenum or an alloy thereof. The slip-over coil 31 is wound with a relatively close pitch, i. e., closely coiled, and is preferably made just large enough in diameter to fit more or less snugly around the filament leg 30. Each end of the filament 20 is connected to the adjacent lead-in wire 21 by welding the coil-enclosed leg 30 of the filament to the said lead-in wire, as indicated in Figs. 3 and 4.

In accordance with the invention, each filament joint or connection to the lead-in wire 21 is provided with suitable heat-dissipating means 32 for maintaining the filament joint at a minimum operating temperature below that temperature at which distortion of the iron lead-in wires 21 would normally occur. Such heat-dissipating means 32 may comprise any suitable heat-conductive member having a large radiating or surface area for the dissipation of heat therefrom. The heat-dissipating means 32 preferably comprises a pair of sheet metal members or plates 33, such as sheet iron for instance, which extend along and are suitably fastened to the lead-in wires 21 so as to overlie and engage the coil-enclosed filament legs 30 at points opposite their connection to the lead-in wires. The plates 33 are preferably fastened to the lead-in wires 21 in such a manner as to extend outwardly away from the said wires in opposite directions therefrom and substantially in the plane of the said wires 21 and filament 20 whereby the plates 33 intercept a minimum of the radiations from the filament so as not to produce undesirable shadows or dark spots in the light beam projected by the lamp. The plates 33 may be secured in place on the lead-in wires 21 in any suitable manner, preferably by spot-welding the plates to the lead-in wires 21 at points on either side of the junctions between the coil-enclosed filament legs 30 and the lead-in wires 21, as indicated at 34 in Fig. 3. The plates 33 preferably are also spot-welded to the coil-enclosed filament legs 30 at points directly over or opposite the junctions of the latter with the lead-in wires 21, as indicated at 35 in Fig. 3.

In addition to dissipating the heat at the filament joints, the radiating plates 33, because of the increased current-carrying cross section which they provide at the filament joints, further serve to diminish the rate of heating of the joints by the current passing therethrough during lamp operation.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In an electric lamp, the combination of a lead-in conductor, a filament having an end portion connected to the said conductor, and a heat-dissipating metal plate in good thermally-conductive engagement with the said filament end portion at a point closely adjacent the connection between the said filament end portion and the lead-in conductor.

2. In an electric lamp, the combination of a lead-in conductor, a filament having an end portion welded to the said conductor, and a heat-dissipating metal plate welded to the said filament end portion at a point closely adjacent the welded joint between the filament end portion and the lead-in conductor.

3. In an electric lamp, the combination of a lead-in conductor, a filament having an end portion connected to the said conductor, and a heat-dissipating metal plate in good thermally-conductive engagement with the said filament end portion at a point closely adjacent the connection between the said filament end portion and the lead-in conductor, said metal plate also engaging said lead-in conductor.

4. In an electric lamp, the combination of an iron lead-in wire, a filament having an end portion extending across and welded to the said conductor, and a thin heat-dissipating metal plate welded to the lead-in conductor and extending over and welded to the filament end portion at a point opposite the welded junction between the filament end portion and the lead-in wire.

5. In an electric lamp, the combination of a lead-in conductor, a heat-dissipating metal plate extending alongside the said lead-in conductor and fastened thereto, and a filament having an end portion extending between and engaging the said lead-in conductor and the metal plate.

6. In an electric lamp, the combination of a filament, a slip-over coil on an end portion of the filament, a lead-in conductor joined to the coil-enclosed filament end portion, and a heat-dissipating metal plate in good thermally-conductive engagement with the coil-enclosed filament end portion at a point closely adjacent the junction between the said coil-enclosed filament end portion and the lead-in conductor.

7. In an electric lamp, the combination of a filament, a slip-over coil on an end portion of the filament, a lead-in conductor extending across and welded to the coil-enclosed filament end portion, and a heat-dissipating metal plate fastened to the said lead-in conductor and extending over and welded to the coil-enclosed filament leg portion at a point opposite the welded junction between the filament end portion and the lead-in conductor.

8. In an electric lamp, the combination of a filament, a slip-over coil on an end portion of the filament, a lead-in conductor extending across and welded to the coil-enclosed filament end portion, and a heat-dissipating metal plate extending over and welded to the coil-enclosed filament leg portion at a point opposite the welded junction between the filament end portion and the lead-in conductor, said metal plate also being welded to the lead-in conductor at points on opposite sides of the coil-enclosed filament end portion.

9. In an electric lamp, the combination of an envelope, a pair of lead-in conductors extending into said envelope and defining a plane, a filament disposed within said envelope substantially in the said plane of the lead-in conductors and having end portions joined to said conductors, and a pair of thin heat-dissipating metal plates disposed substantially in the plane of said lead-in conductors and in good thermally-conductive engagement with the filament end portions at points closely adjacent their junctions with the lead-in conductors.

10. In an electric lamp, the combination of an envelope, a pair of lead-in conductors extending into said envelope and defining a plane, a filament disposed within said envelope substantially in the said plane of the lead-in conductors and having end portions joined to said conductors, and a pair of thin heat-dissipating metal plates fastened to the said lead-in conductors and in good thermally-conductive engagement with the end portions of the filament at points closely adjacent their junctions with the lead-in conductors, said metal plates being disposed substantially in the plane of the lead-in conductors and extending outwardly therefrom.

11. In an electric lamp, the combination of an envelope, a monoplane filament disposed within said envelope and having uncoiled end portions, slip-over coils on the said end portions of the filament, a pair of lead-in conductors extending into said envelope substantially in the plane of the filament and welded to the coil-enclosed filament end portions, and a pair of thin heat-dissipating metal plates welded to the lead-in conductors and extending over and welded to the coil-enclosed end portions of the filament at points opposite the welded junctions between the lead-in conductors and said filament end portions, said metal plates being disposed substantially in the plane of the filament and extending outwardly from the lead-in conductors.

12. An electric incandescent lamp comprising an envelope, a light-concentrating reflecting surface within said envelope, a pair of lead-in conductors extending into said envelope and defining a plane therein, a filament disposed within said envelope substantially in the plane of said lead-in conductors and in definite relation to the focus of said reflecting surface, said filament having end portions connected to the said lead-in conductors, and a pair of thin heat-dissipating metal plates disposed substantially in the plane of said lead-in conductors and in good thermally-conductive engagement with the filament end portions at points closely adjacent their connections with the lead-in conductors.

RICHARD E. SMITH.